DISA Modeling and Simulation

AMG-13: C4ISR Model RTI Use Update
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C4I

Purpose for the Briefing

To provide information on:

+ **Model Status**
+ **Objectives of the Model**
+ **Federation Interaction**
+ **RTI Services Used**
+ **RTI Issues**

C4ISR Model Status

Feb 96 - DMSO RTI User

Prototype C4 Infrastructure
+ JWARS
+ JSIMS

Version 1 Components Identified

Version 1 (alpha) Scheduled for July 1996

C4ISR Model - Version 1 Objectives

Develop a Common Operational Picture (COP)
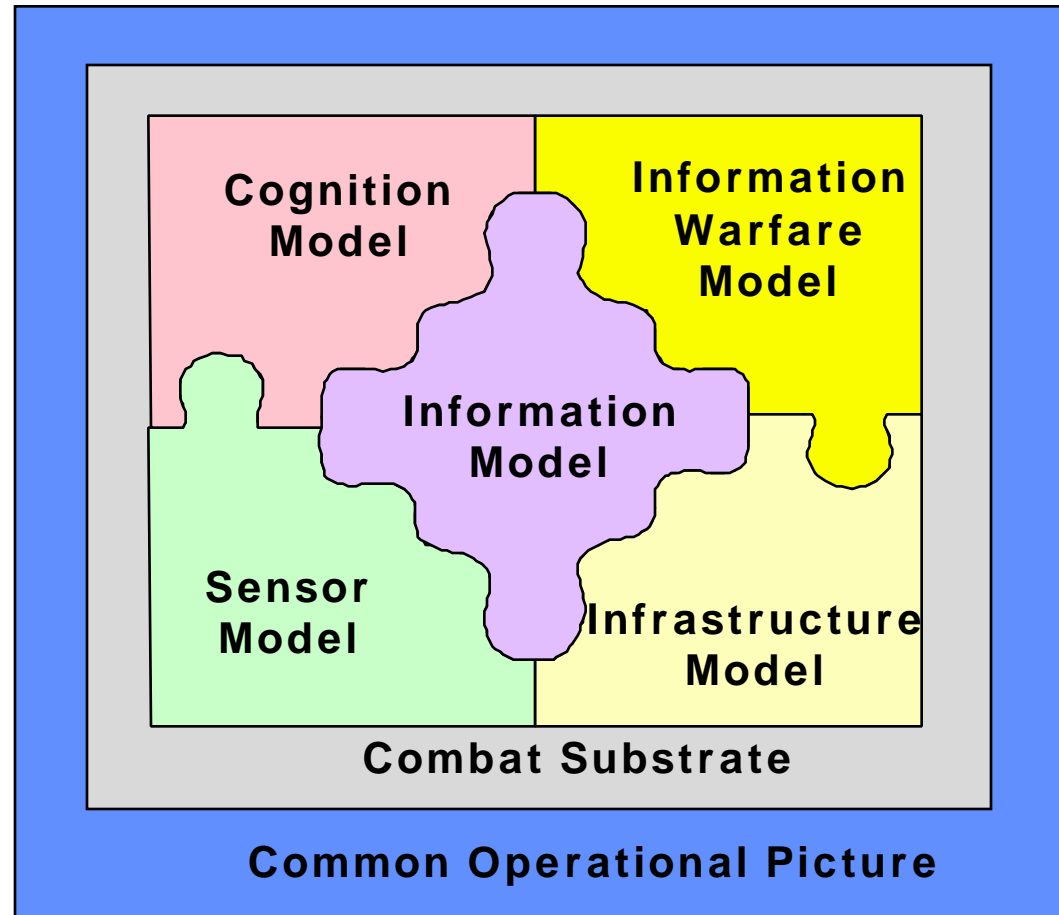+ **Intelligence, Sensor, and Reconnaissance**
+ **IW influence**

Decisions based from the COP
+ **Influenced by IW**
+ **Latency of information flow**

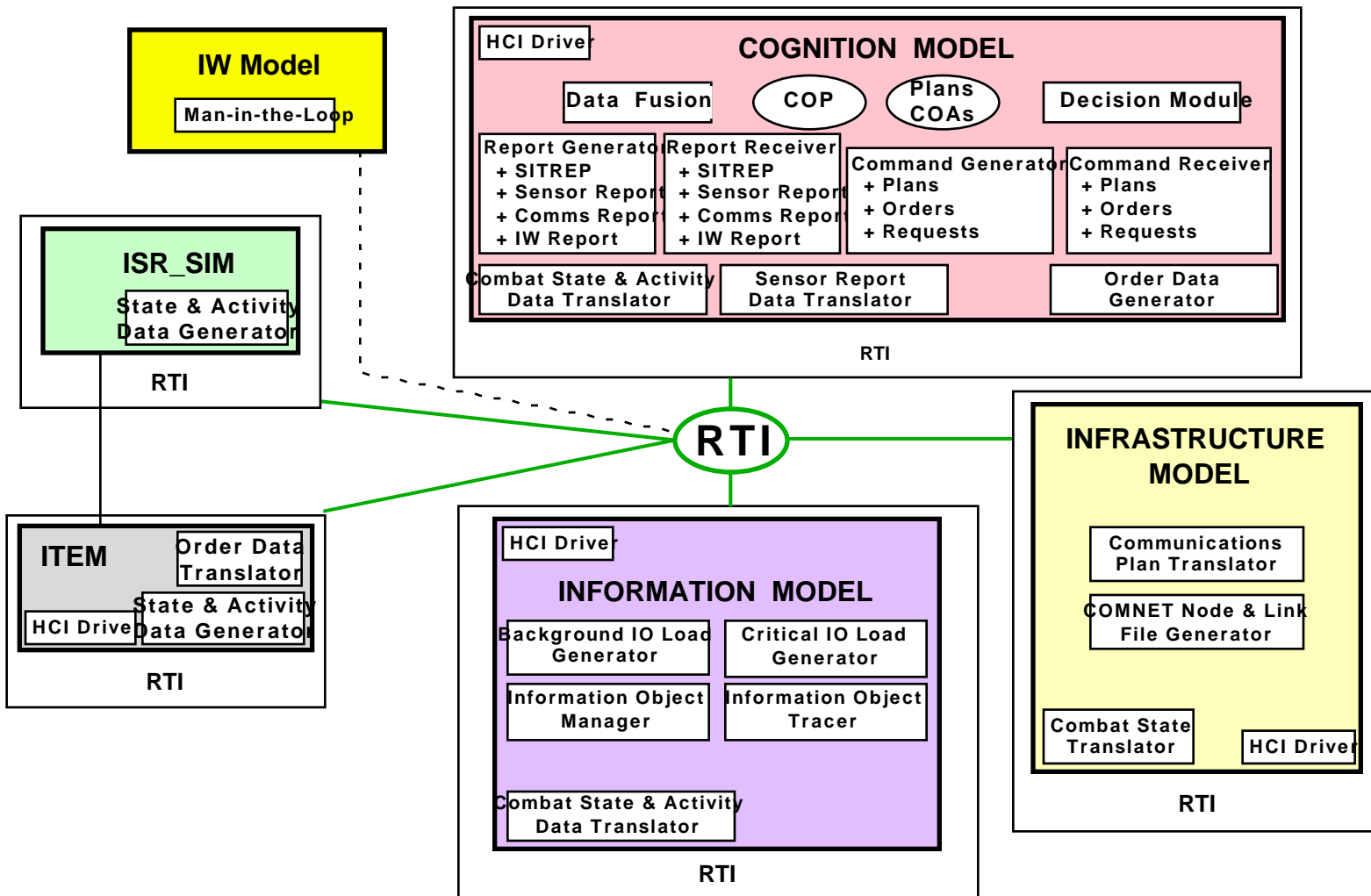**Traceability of Information Objects**

Complete JWARS Use Cases

Elements of C4ISR Interaction

The C4ISR Model Flow

IW Model

Man-in-the-Loop

ISR_SIM

State & Activity
Data Generator

RTI

ITEM

Order Data
Translator

State & Activity
Data Generator

HCI Driver

RTI

COGNITION MODEL

HCI Driver

Data Fusion   COP   Plans COAs   Decision Module

Report Generator
+ SITREP
+ Sensor Report
+ Comms Report
+ IW Report

Report Receiver
+ SITREP
+ Sensor Report
+ Comms Report
+ IW Report

Command Generator
+ Plans
+ Orders
+ Requests

Command Receiver
+ Plans
+ Orders
+ Requests

Combat State & Activity
Data Translator

Sensor Report
Data Translator

Order Data
Generator

RTI

RTI

INFORMATION MODEL

HCI Driver

Background IO Load
Generator

Critical IO Load
Generator

Information Object
Manager

Information Object
Tracer

Combat State & Activity
Data Translator

RTI

INFRASTRUCTURE MODEL

Communications
Plan Translator

COMNET Node & Link
File Generator

Combat State
Translator

HCI Driver

RTI

C4ISR Model RTI Services Used

• Federation Management
- – Create Federation Execution   ST
- – Destroy Federation Execution   ST
- – Join Federation Execution   ST
- – Resign Federation Execution   ST

• Declaration Management
- – Publish object class   T
- – Publish object attributes   T
- – Publish Interaction Class   T
- – Subscribe object class   T
- – Subscribe object attributes by class   T
- – Subscribe interaction class   T

• Object Management
- – Id Request   T
- – Instantiate Object   T
- - Update Attribute Values   T
- - Instantiate Discovered Object   T
- - Remove Object   T
- - Reflect Attributes Values   T
- - Send Interaction   T
- - Receive Interaction   T

• Time Management
- - Initialize Federation Time and Rate
- - Change Federation Time
- - Time Advance Request
- - Time Advance Grant

Legend:

T = Tested with test federation program

ST = Stress tested, explored

RTI Status: 30 Days Ago

- **Tested necessary RTI functionality with RTI Test program**
- **Stress testing 0.32 Version concurrent with C4ISR model RTI integration.**
  - **Integrating Infrastructure, Information, and Simulation Controller**
- **RTI issues (0.32 Version)**
  - **Number of federates**
    - **Potential fix for 0.32 Release rti_ambassador problem identified**
    - **Limit of 5 federates per host**
      - **Register Combat and Sensor as 1 federate**
      - **Run model on two hosts**
  - **Time management protocol**
    - **RTI programmer for Time Management routine meeting**

RTI Status: 14 Days Ago

- **0.32 functionality successfully tested using Infrastructure, Information, Simulation Controller federates.**
  - **Federation Management - Create, Join, Destroy, Resign**
  - **Declaration Management - Publish, Subscribe**
  - **Object Management - Id Request, Instantiate Discovered Object**
- **RTI issues (0.32 Version)**
  - **Structure handling**
    - Problem passing even simple structures found during testing
    - Work around in process to redesign FOM without structures.
    - 115 Objects in C4ISR FOM require modification.
    - Attribute list of CTIO Object grew from 6 to 54 attributes.
  - **Robustness**
    - RTI occasionally locks during joining more than 3 federates.

- **0.33 functionality successfully tested using Infrastructure, Information, Simulation Controller federates.**
  - **Federation Management - Create, Join, Destroy, Resign**
  - **Declaration Management - Publish, Subscribe**
  - **Object Management - Id Request, Instantiate Discovered Object , Send & Receive Interaction, Update Object Attributes**
- **RTI issues (0.33 Version)**
  - **Structure handling**
    - **Will not handle enumerated values (i.e. Side color variable)**
    - **Work around in process completed.**
    - **Casted enumerated values to "longs".**
    - **Receiving end translates "longs" to enumerated.**
  - **Robustness**
    - **RTI occasionally locks during joining more than 3 federates.**
  - **Objects Subscription**
    - **Unexpected results in attribute updates (i.e. whole list instead of changed set)**
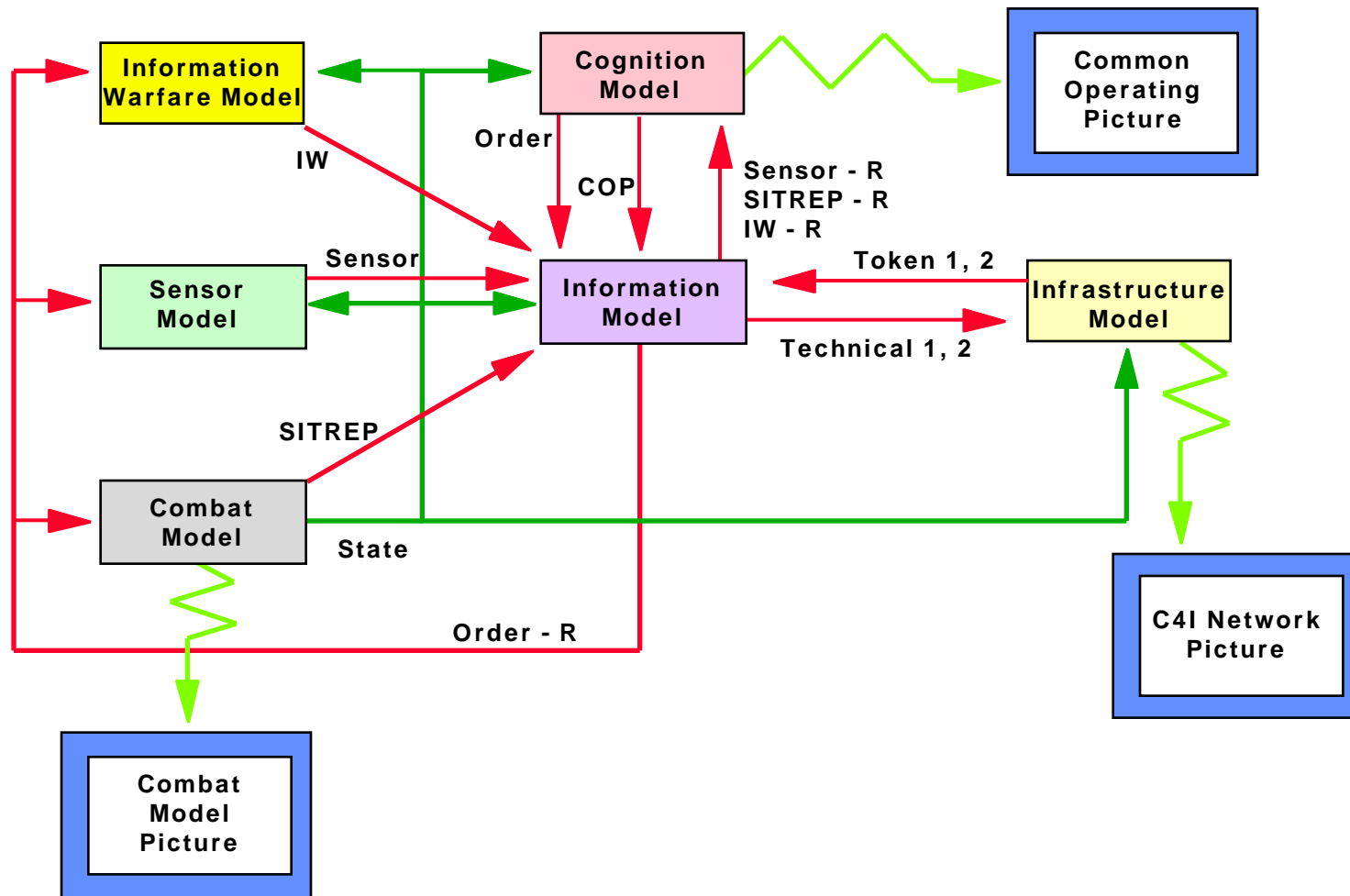
Back ups

C4ISR Model COE Compatibility

(DII COE I&RTS: Rev 2.0 23 Oct 95)
LEE documentation not available

- **Standards (level 1)**   compliant
- **Network (Level 2)**   compliant
- **Workstation (Level 3)**   RTI issues
- **Bootstrap (Level 4)**   modification required
- **Minimal COE (Level 5)**   application mods required
- **Intermediate COE (Level 6)**   application mods required
- **Interoperable (Level 7)**   application mods required
- **Full COE (Level 8)**   application mods required
- **Recommended Guidelines**   compliant
- **Supported Configuration**   compliant
- **COE Runtime Tools**   optional
- **Software Metrics**   ? validation testing required
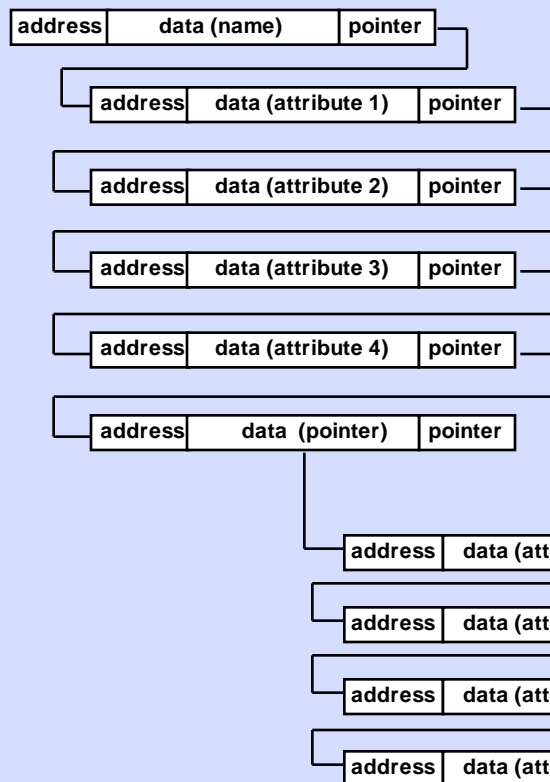- **Styles**   ? examination required

The C4ISR Model RTI Flow
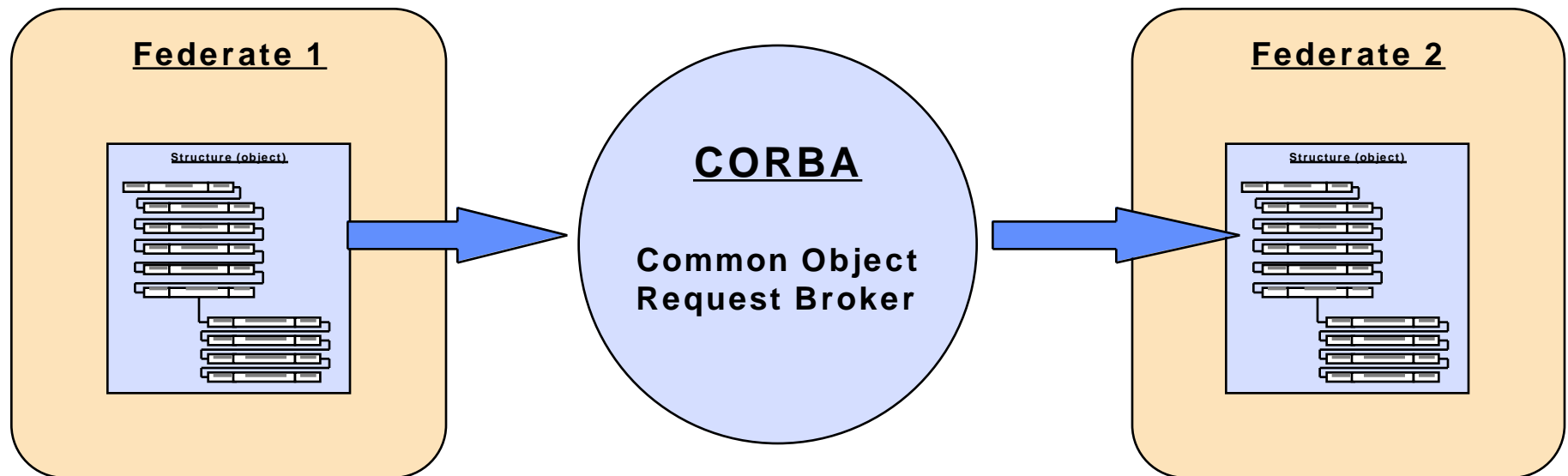
Data Structure Concept

Structure (object)

address	data (name)	pointer

address	data (attribute 1)	pointer

address	data (attribute 2)	pointer

address	data (attribute 3)	pointer

address	data (attribute 4)	pointer

address	data (pointer)	pointer

address	data (attribute 5-1)	pointer

address	data (attribute 5-2)	pointer

address	data (attribute 5-3)	pointer

address	data (attribute 5-4)	pointer

fundamental to object-oriented languages

Simple Data List

name,
attribute 1,
attribute 2,
attribute 3,
attribute 4,
attribute 5-1,
attribute 5-2,
attribute 5-3,
attribute 5-4

- **Class declaration defines structure**
    - class name
    - attribute names
    - attribute data types
- **Objects (class instances) managed by class methods**
    - memory allocated or deallocated
    - attribute values assigned
- **Objects & attributes referenced by name**

C4I

Object Transfer Under CORBA

Federate 1

Structure (object)

CORBA

Common Object Request Broker

Federate 2

Structure (object)

Data Transfer Under HLA RTI

Federate 1

Structure (object)

Simple Data List

name,
attribute 1,
attribute 2,
attribute 3,
attribute 4,
attribute 5-1,
attribute 5-2,
attribute 5-3,
attribute 5-4

decompose objects

RTI (today)

Federate 2

Simple Data List

name,
attribute 1,
attribute 2,
attribute 3,
attribute 4,
attribute 5-1,
attribute 5-2,
attribute 5-3,
attribute 5-4

Structure (object)

recompose objects

C4I